Lloyd's Register

Rules and Regulations for the Manufacture, Testing and Certification of Materials, July 2013

Notice No. 2

Effective Date of Latest Amendments:

See page 1

Issue date: December 2013

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RULES AND REGULATIONS FOR THE MANUFACTURE, TESTING AND CERTIFICATION OF MATERIALS, *July 2013*

Notice No. 2

This Notice contains amendments within the following Sections of the *Rules and Regulations for the Manufacture, Testing and Certification of Materials, July 2013.* The amendments are effective on the dates shown:

Chapter	***Section***	***Effective date***
3	3	1 January 2014
9	1	1 January 2014
11	1, 3, 4, 5, 7	1 January 2014
12	2	1 January 2014

It will be noted that the amendments also include corrigenda, which are effective from the date of this Notice.

The *Rules and Regulations for the Manufacture, Testing and Certification of Materials, July 2013* are to be read in conjunction with this Notice No. 2. The status of the Rules is now:

Rules for Materials	Effective date:	July 2013
Notice No. 1	Effective date:	1 August 2013
Notice No. 2	Effective date:	1 January 2014

Chapter 3

Rolled Steel Plates, Strip, Sections and Bars

Effective date 1 January 2014

■ *Section 3*
Higher strength steels for ship and other structural applications

3.1 Scope

(*Part only shown*)
Table 3.3.1 Maximum thickness limits

Steel designation				Maximum thickness mm	
				Plates and wide flats	Sections and bars
AH 27S	DH 27S	EH 27S	FH27S	100 (see Note 1)	50
AH 32	DH 32	EH 32	FH32		
AH 36	DH 36	EH 36	FH36		
AH 40	DH 40	EH40	FH40		
~~AH 47~~ (*see* Note 2)	~~DH 47~~	EH 47	~~FH 47~~		Not applicable

3.4 Chemical composition

Table 3.3.3 Chemical composition for Grade ~~AH 47, DH 47,~~ EH 47 ~~and FH 47~~

Table 3.3.4 Carbon equivalent requirements for higher tensile strength steels up to 100 mm in thickness when supplied in the TM condition

Grade				Carbon Equivalent, max. (%)	
				$t \leq 50$	$50 < t \leq 100$
AH 27S	DH 27S	EH 27S	FH 27S	0,36	0,38
AH 32	DH 32	EH 32	FH 32	0,36	0,38
AH 36	DH 36	EH 36	FH 36	0,38	0,40
AH 40	DH 40	EH 40	FH 40	0,40	0,42
~~AH 47~~	~~DH 47~~	EH 47	~~FH 47~~	Not applicable (*see* Table 3.3.1)	0,49

NOTE
t = thickness, in mm.

3.5 Condition of supply

(*Part only shown*)
Table 3.3.5 Conditions of supply for plates and wide flats

Grade	Grain refining practice (*see* Note 1)	Thickness range mm	Conditions of supply (*see* Note 2)				
~~AH 47~~ ~~DH 47~~ EH 47 ~~FH 47~~	Any practice	≤ 50	Not applicable				
		>50 ≤100	—	—	~~TM~~ —	TM	QT

(*Part only shown*)

Table 3.3.7 Mechanical properties for acceptance purposes (*see* Note 1)

Grades (*see* Note 3)	Yield Stress N/mm^2 min.	Tensile Strength N/mm^2	Elongation on 5,65 $\sqrt{S_o}$ % min. (*see* Note 2)	Charpy V-notch impact tests (*see* Notes 3, 4 and 5)					
				Average energy J minimum					
				$t \le 50$ mm		$50 < t \le 70$ mm		$70 < t \le 100$ mm	
				Longitudinal	Transverse	Longitudinal	Transverse	Longitudinal	Transverse
AH 40 DH 40 EH 40 FH 40	390	510 – 650	20	39	26	46	31	55 (*see* Note 8)	37 (*see* Note 8)
~~AH 47~~ ~~DH 47~~ EH 47 ~~FH 47~~	460	570 – 720	17	–	–	53	35	64 (*see* Note 8)	42 (*see* Note 8)

NOTE

8. The Charpy V-notch impact energy for crack arrest steels of grade EH40, FH40 and EH47 intended for longitudinal strength members in container ships in thickness between 85 mm and 100 mm are to be:

Grade	$85 < t \le 100$ mm	
	Longitudinal	Transverse
AH40 DH40 EH40 FH40 EH47	75 J	50 J

Chapter 9

Copper Alloys

Effective date 1 January 2014

■ *Section 1*
Castings for propellers

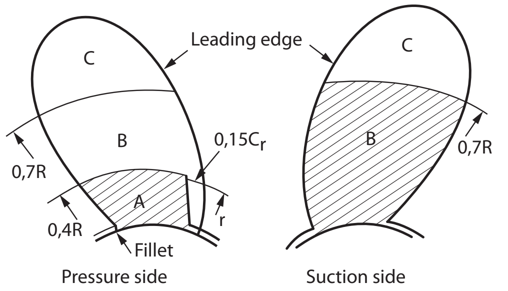
1.4 Chemical composition

Table 9.1.1 Chemical composition of propeller and propeller blade castings

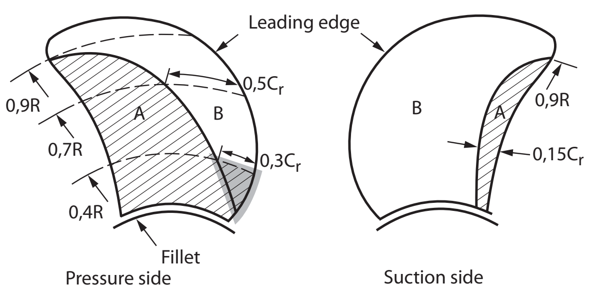
Alloy designation	Chemical composition of ladle samples %							
	Cu	Sn	Zn	Pb	Ni	Fe	Al	Mn
Grade Cu 2 Ni-manganese bronze (high tensile brass)	50–57	~~1,5 max.~~ 0,1–1,5	33–38	0,5 max.	~~2,5~~ 3,0–8,0	0,5–2,5	0,5–2,0	1,0–4,0

1.8 Inspection and non-destructive examination

1.8.2 All finished castings are to be subjected to a comprehensive visual examination by the Surveyor, including internal surfaces such as the bore and bolt holes. Where unauthorised weld repairs are suspected by the Surveyor, the area is to be etched (e.g., by iron chloride) for the purpose of confirmation.



(a) Blades with propeller skew angles of 25° or less



(b) Blades with propeller skew angles of greater than 25°

R = propeller radius
C_r = chord length at radius r

NOTE
For a definition of skew angle, *see* the relevant Rules

Fig. 9.1.2 Severity zones in all propeller blades

(*Part only shown*)

Table 9.1.4 Permissible rectification of new propellers by welding

Severity zone or region	Maximum individual area of repair	Maximum total area of repairs
Zone A	Weld repairs not generally permitted	
Zone B	Defects that are not deeper than (*t*/40) mm or 2 mm, whichever is greater, below the minimum local thickness are to be removed by grinding. Defects which are deeper than allowable for removal by grinding may be repaired by welding.	
~~Zone B~~ Zone C	60 cm^2 or 0,6% x *S* whichever is the greater	200 cm^2 or 2% x *S*, whichever is the greater in combined Zones B and C but not more than 100 cm^2 or 0,8% x *S*, whichever is the greater, in Zone B on the pressure side
Other regions (*see* Note)	17 cm^2 or 1,5% area of the region which-ever is the greater	50 cm^2 or 5% x area of the region which-ever is the greater

where t = minimum local thickness in mm

S = area of one side of a blade = $0,79 \dfrac{D^2 B}{N}$

D = finished diameter of propeller
B = developed area ratio
N = number of blades

Chapter 11

Approval of Welding Consumables

Effective date 1 January 2014

Section 1
General

1.2 Grading

(*Part only shown*)

Table 11.1.1 Welding consumable grades appropriate to structural and low temperature service steel grades

Consumable grade	Suitable for steel grades (*see* Notes)			
1. Ship Grade Steels (Ch 3,2 and Ch 3,3)				
~~2Y47~~	—	—	~~***AH40***~~	~~***AH47***~~
~~2Y47~~	—	—	~~***DH40***~~	~~***DH47***~~
3Y47	—	—	***EH40***	***EH47***
~~4Y47~~	—	—	~~***FH40***~~	~~***FH47***~~

Section 3
Electrodes for manual and gravity welding

3.1 Grading

(*Part only shown*)

Table 11.3.1 Minimum low hydrogen approval requirements for manual and gravity electrodes

Approval grades	Low hydrogen grade required
~~2Y47 to 4Y47~~ 3Y47	H10

3.2 Deposited metal test assemblies

(*Part only shown*)

Table 11.3.2 Requirements for deposited metal tests (covered electrodes)

Grade (*see* Note 3)	Yield stress N/mm^2 minimum	Tensile strength N/mm^2 (*see* Note 1)	Elongation on 50 mm % minimum	Charpy V-notch impact tests	
				Test temperature °C	Average energy (*see* Note 2) J minimum
~~2Y47,~~ 3Y47~~, 4Y47~~	460	570 – 720	19	~~0,~~ –20~~, –40~~	53

3.3 Butt weld test assemblies

3.3.4 The grades of steel used for the preparation of the test assemblies are to be as follows:

Grade 1 (1N) electrodes	A
Grade 2 (2N) electrodes	A, B or D
Grade 3 (3N) electrodes	A, B, D or E
Grade 2Y electrodes	AH32, AH36, DH32 or DH36
Grade 3Y electrodes	AH32, AH36, DH32, DH36, EH32 or EH36
Grade 4Y electrodes	AH32, AH36, DH32, DH36, EH32, EH36, FH32 or FH36
Grade 2Y40 electrodes	AH40 or DH40
Grade 3Y40 electrodes	AH40, DH40 or EH40
Grade 4Y40 electrodes	AH40, DH40, EH40 or FH40
Grade 5Y40 electrodes	AH40, DH40, EH40 or FH40
~~Grade 2Y47 electrodes~~	~~AH47, DH47~~
Grade 3Y47 electrodes	~~AH47, DH47,~~ EH47
~~Grade 4Y47 electrodes~~	~~AH47, DH47, EH47 or FH47~~

(*Part only shown*)

Table 11.3.3 Requirements for butt weld tests (covered electrodes)

Grade (*see* Note 3)	Tensile strength N/mm^2	Bend test ratio: $\frac{D}{t}$	Charpy V-notch impact tests	
			Test temperature °C	Average energy (*see* Note 1) J minimum
				All positions (*see* Note 2)
~~2Y47,~~ 3Y47~~, 4Y47~~	570 – 720	4	~~0,~~ –20~~, –40~~	53

■ Section 4
Wire-flux combinations for submerged-arc automatic welding

4.1 General

(*Part only shown*

Table 11.4.1 Minimum low hydrogen approval requirements for wire-flux combinations

Approval grade	‘H’ grade for Multi-run	‘H’ grade for Two-run
~~2Y47 to 4Y47~~ 3Y47	H10	H15

4.3 Deposited metal test assemblies (multi-run technique)

(*Part only shown*)

Table 11.4.2 Requirements for deposited metal tests (wire-flux combinations)

Grade	Yield stress N/mm^2 minimum	Tensile strength N/mm^2	Elongation on 50 mm % minimum	Charpy V-notch impact tests	
				Test temperature °C	Average energy (*see* Note) J minimum
~~2Y47,~~ 3Y47~~, 4Y47~~	460	570 – 720	19	~~0,~~ –20~~, –40~~	53

4.4 Butt weld test assemblies (multi-run technique)

4.4.2 The grade of steel used for the preparation of the test assembly are to be as follows:

Grade 1 wire-flux combination	A
Grade 2 wire-flux combinations	A, B or D
Grade 3 wire-flux combinations	A, B, D or E
Grade 1Y wire-flux combination	AH32 or AH36
Grade 2Y wire-flux combinations	AH32, AH36, DH32 or DH36
Grade 3Y wire-flux combinations	AH32, AH36, DH32, DH36, EH32 or EH36
Grade 4Y wire-flux combinations	AH32, AH36, DH32, DH36, EH32, EH36, FH32 or FH36
Grade 2Y40 wire-flux combination	AH40 or DH40
Grade 3Y40 wire-flux combinations	AH40, DH40 or EH40
Grade 4Y40 wire-flux combinations	AH40, DH40, EH40 or FH40
Grade 5Y40 wire-flux combinations	AH40, DH40 EH40, FH40
~~Grade 2Y47 wire-flux combinations~~	~~AH47 or DH47~~
Grade 3Y47 wire-flux combinations	~~AH47, DH47 or~~ EH47
~~Grade 4Y47 wire-flux combinations~~	~~AH47, DH47, EH47 or FH47~~

Where Grade 32 higher tensile steel is used, the tensile strength is to be not less than 490 N/mm^2. The chemical composition, including the content of grain refining elements, is to be reported in all cases where higher tensile steel is used.

Table 11.4.3 Requirements for butt weld tests (wire-flux combinations)

Grade	Tensile strength N/mm^2	Bend test ratio: $\frac{D}{t}$	Charpy V-notch impact tests	
			Test temperature °C	Average energy (*see* Notes 1 and 2) J minimum
~~2Y47,~~ 3Y47~~, 4Y47~~	570 – 720	4	~~0,~~ –20~~, –40~~	53

Section 5
Wires and wire-gas combinations for manual, semi-automatic and automatic welding

5.1 General

(*Part only shown*)

Table 11.5.1 Minimum low hydrogen approval requirements for wires and wire-gas combinations

Approval grade	‘H’ grade for m and S techniques	‘H’ grade for M technique	‘H’ grade for T technique
~~2Y47 to 4Y47~~ 3Y47	H10	H10	H10

Section 7
Consumables for use in one-side welding with temporary backing materials

7.1 General

(*Part only shown*)

Table 11.7.1 Minimum low hydrogen approval requirements for one-side welding with combinations including temporary backing material

Approval grades	‘H’ grade for m and S techniques	‘H’ grade for M technique	‘H’ grade for A technique
~~2Y47 to 4Y47~~ 3Y47	H10	H10	H15

Chapter 12
Welding Qualifications

Effective date 1 January 2014

Section 2
Welding ~~P~~procedure ~~Q~~qualification ~~T~~tests for ~~S~~steels

2.12 Mechanical test acceptance criteria for steels

(*Part only shown*)

Table 12.2.3 Impact test requirements for butt joints ($t > 50$ mm)~~,~~ *see* Note 1

Grade of steel	Test temperature (ºC) ~~s~~*See* Note 2	Value of absorbed energy (J, min), *see* Note 2		
		Manual or semi-automatic welded joints		Automatically welded joints
		Downhand, Horizontal, Overhead	Vertical upward, Vertical downward	
~~AH47~~	~~20~~	~~53~~	~~53~~	~~53~~
~~DH47~~	~~0~~	~~53~~	~~53~~	~~53~~
EH47	–20	~~53~~ 64	~~53~~ 64	~~53~~ 64
~~FH47~~	~~–40~~	~~53~~	~~53~~	~~53~~

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